

SOME OBSERVATIONS ON THE GENITALIA OF LACHNOSTERNA.

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In making a study of the *Lachnosterna* of Kansas, the writers have examined approximately 50,000 specimens for specific determination. The works of Horn (1887) and Smith (1889) were used in most of this work. Smith's paper was especially helpful in making specific determinations, because of the large series of figures illustrating the genital characters which are now generally recognized as the best means of separating the different species of this genus. Several species of *Lachnosterna* occur in Kansas, however, that are not figured in this paper, and in order to facilitate the identification of them, illustrations of the genitalia were prepared.†

Since many others are working with this group, it seemed advisable to present these figures at this time in the nature of a supplement to Smith's paper. It is not the purpose of the writers to go into detail concerning the identification of the various species, since Glasgow (1916) states that he is making a thorough systematic study of the genus. Several discrepancies in Smith's figures of *L. corrosa*, *L. crenulata*, and *L. rubiginosa* are also discussed. In addition, a brief discussion is made of specific and sexual determination in the pupal stage.

DISCUSSION OF GENITALIA.

Lachnosterna prætermisssa Horn (Plate I, Fig. 7).

This species is occasionally taken in Kansas, seven females and four males having been collected in the vicinity of Manhattan. The figures of the male genitalia are presented by Smith. The female genitalia approach that of *L. implicata*. Superior plates are wanting and the pubic process is characterized by being heart-shaped, deeply cleft, slightly divaricate and clothed with a sparse covering of short, erect hairs.

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Lachnosterna longitarsa Say (Plate I, Fig. 4).

A good series of this species was taken in flight at Manhattan during the summer of 1917. Illustrations of the female genitalia are lacking in Smith's paper. In the female the inferior plates are subquadrate and the superior plates are triangular. The pubic process is reduced to a small protuberance between the superior plates.

Lachnosterna hirtiventris Horn (Plate I, Fig. 3).

A number of specimens of this species are in the writer's collection from southern Kansas. Only the male genitalia are figured in Smith's work. The superior plates in the female are lightly corrugated and the pubic process is deeply cleft and slightly divaricate.

Lachnosterna calceata Lec. (Plate I, Fig. 1).

L. calceata is a common species in the southern half of Kansas. Smith does not figure either sex of this species. The genitalia of the male are symmetrical and approach the *L. crassissima* type. In the female the superior plates are modified into the pubic process which is elongate, bifid and tapering to a point.

Lachnosterna glabricula Lec. (Plate I, Fig. 6).

The males of this species are common in the vicinity of Manhattan during July and August. Three females were found around the roots of sumach (*Rhus* sp.) in 1917, in an area from which the males were emerging in large numbers. The pubic process in the female is wanting. The superior plates are fused, deeply emarginate and fringed on the posterior end with moderately long hairs.

Lachnosterna tristis Fab. (Plate I, Fig. 5).

This species is rare in some sections of Kansas. Smith presents figures of the male genitalia only. The female genitalia are rather simple as in *L. heterodoxa*, consisting of an unique development of the inferior plates. In the case of *L. tristis*, the grooves formed by a fold on the ventral side of the inferior plates are longer and apparently deeper than in *L. heterodoxa*. The posterior ends of these plates are fringed with slightly recumbent hairs.

***Lachnosterna corrosa* Lec. (Plate I, Fig. 2).**

This species is frequently encountered in Kansas. According to Glasgow (1916) *L. affinis* is synonymous with *L. corrosa*. An examination of the specimens at hand show a variation in the genitalia of both sexes from the illustrations presented by Smith for either *L. corrosa* or *L. affinis*. In general they more nearly approach the *L. affinis* type. In the males the claspers are seen to be unsymmetrical. The female genitalia are rather characteristic. The inferior plates are large and are notched to receive the greatly reduced and modified superior plates. The pubic process is prolonged, divaricated and sparsely clothed with hairs.

***Lachnosterna crenulata* Froel., and *Lachnosterna rubiginosa* Lec. (Plate I, Figs. 8 and 9).**

These two species occur in Kansas, the latter being one of the most common species in the vicinity of Manhattan. Both species are readily separated by the character of the lateral margin of the thorax which is strongly crenate in *L. crenulata* and but feebly so in *L. rubiginosa*. The genital organs of the females of both species are rather simple and very similar. The superior plates are fused along the median line and are deeply emarginate. A small, tooth-like projection occurs at the base of this emargination in *L. rubiginosa*. In Smith's figures, this tooth-like process is shown in *L. crenulata*. The superior plates are fringed with hairs of moderate length, the hairs being more numerous in *L. crenulata*.

SPECIFIC DETERMINATION IN THE PUPA.

Since it is often desirable to be able to identify the species of *Lachnosterna* pupæ, the following observations are offered as an aid of considerable value in the case of pupæ that have reached a somewhat advanced stage of development. As is well known, the grubs are not specifically separable and it is usually necessary to rear them to adults in order to make determinations. Often they reach the pupal stage and die. Fortunately, the genitalia develop at a comparatively early stage and so lie within the body of the pupa that they become visible through the pupal skin after the adult coloration begins to develop.

The sexes are easily distinguished as soon as pupation occurs. The lamellate club of the antennæ in most species is larger in the male than the female, and thus affords one means of determination. However, this offers some difficulty in species where size differences are not pronounced. In such instances, a second and more reliable method can be adopted. On the ventral surface of the female pupa, immediately cephalad to the anal slit, are two elevated subquadrate structures (Plate II, Fig. 10 r) which are characteristic of female pupæ. In the male (Plate II, Fig. 11 r) the same structures are present, but lying somewhat between and caudad to them is a third rounded and somewhat conical elevation (Plate II, Fig. 11 t) which is characteristic of all male pupæ examined. The sex of *L. lanceolata* is also determinable by the size and shape of the male and female pupæ.

The anal aperture of the adult beetle developing within the pupa is so opened as to allow the genitalia of both the males and females to protrude enough to be discernable under the pupal skin. They can be seen under and in the near vicinity of the structures described above, which are used in sex determination. All that is needed is a familiarity with the genitalia of the different species. Figure 11-N shows a ventral view of the posterior region of a male pupa of *L. crassissima*, and Figure 11-O is a lateral view of the same. In both views the male genital organ can be plainly seen in the region marked "x." Figure 10-L is a ventral view of the female of the same species, and Figure 10-M is a lateral view. In the female the genital organ may be found somewhat anterior to the two lobular subquadrate structures, as shown in Plate II, Fig. 10-p, or they may lie directly beneath them.

As stated, the genitalia are only visible after the body begins to assume its darkened coloration. Records kept during the past summer show this time of coloring to vary, but it is of sufficient duration in a large number of cases to enable determination to be made over the latter half of the pupal period. The pupal period of *L. crassissima* was found to vary from 16 to 58 days, with an average, for 178 individuals observed, of 30.5 days. The following table shows, in a few individuals observed, the time elapsing between pupation and the date when specific determination was possible, as well as the time during which the genitalia were visible.

TABLE I.
PERIOD OF PUPAL DETERMINATION.

Species	Number of days from pupation to determination	Number of days from determina- tion to maturity	Length of pupal stage days	Sex
<i>L. crassissima</i>	14	15	29	♂ + ♀
	13	16	29	
	7	22	29	
	15	13	28	
	16	12	28	
	15	15	30	
	14	16	30	
	15	15	30	
	12	18	30	
	12	18	30	
	17	11	28	
	5	25	30	
	15	14	29	
	13	18	31	
<i>L. rubiginosa</i>	10	18	28	♂ + ♀
	26	4	30	
	24	4	28	
	22	6	28	
	11	19	30	
<i>L. rugosa</i>	17	13	30	♂

Two striking cases are to be noted in the case of *L. crassissima* when the pupal specific identification was made 22 and 25 days before maturity in pupæ, whose complete pupal stages were 29 and 30 days, respectively. The genital plates of the females of *L. rubiginosa* are not very prominent even in the adults which may account for the shorter period allowed for the determination in the three females noted in the table. Other species in which similar determinations were made include *L. implicata*, *L. crenulata*, *L. prætermissa*, *L. bipartita*, *L. corrosa*, and *L. lanceolata*.

LITERATURE CITED.

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- SMITH, J. B., 1889. Notes on the Species of Lachnosterna of Temperate North America with Descriptions of New Species. Proc. U. S. Nat. Mus., XI:481-523. 13 plates.

EXPLANATION OF PLATES.

PLATE VIII.

- Fig. 1. Genitalia of *L. calceata*, male and female.
Fig. 2. Genitalia of *L. corrosa*, male and female.
Fig. 3. Genitalia of *L. hirtiventris*, female.
Fig. 4. Genitalia of *L. longitarsa*, female.
Fig. 5. Genitalia of *L. tristis*, female.
Fig. 6. Genitalia of *L. glabricula*, female.
Fig. 7. Genitalia of *L. prætermessa*, female.
Fig. 8. Genitalia of *L. crenulata*, female.
Fig. 9. Genitalia of *L. rubiginosa*, female.

PLATE IX.

- Fig. 10. Caudal segments of pupa of *L. crassissima*, female.
Fig. 11. Caudal segments of pupa of *L. crassissima*, male.

ABBREVIATIONS USED IN FIGURES.

- A. Female genitalia, ventral view.
B. Female genitalia, lateral view.
C. Female genitalia, dorsal view.
D. Male genitalia, dorsal view.
E. Male genitalia, left clasper, lateral view.
F. Male genitalia, caudal view.
G. Male genitalia, right clasper, lateral view.
H. Male genitalia, ventral view.
L. Caudal segments of pupa of ♀ *L. crassissima*, ventral view.
M. Caudal segments of pupa of ♀ *L. crassissima*, lateral view.
N. Caudal segments of pupa of ♂ *L. crassissima*, ventral view.
O. Caudal segments of pupa of ♂ *L. crassissima*, lateral view.
i. Inferior plates.
p. Pubic process.
r. Subquadrate structures.
s. Superior plates.
t. Conical protuberances.
x. Male genitalia.